

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claims 1-32 (canceled).

Claim 33 (currently amended): ~~The surface acoustic wave filter according to Claim 27, wherein~~ A surface acoustic wave filter comprising:

a piezoelectric substrate; and

a longitudinally-coupled-resonator surface acoustic wave filter portion provided on the piezoelectric substrate; wherein

the longitudinally-coupled-resonator surface acoustic wave filter portion includes an odd number of at least three interdigital transducers arranged such that a plurality of comb electrodes having a plurality of electrode fingers are interdigitated, the interdigital transducers being disposed along a surface-acoustic-wave propagation direction, and first and second reflectors disposed along the surface-acoustic-wave propagation direction so that the at least three interdigital transducers are located between the first and second reflectors;

the odd number of at least three interdigital transducers include a central interdigital transducer arranged in the approximate center, and first and second interdigital transducers disposed at two sides of the central interdigital transducer, an electrode finger of the first interdigital transducer which is adjacent to the central interdigital transducer is a ground electrode, and an electrode finger of the second interdigital transducer which is adjacent to the central interdigital transducer is a signal electrode;

the comb electrodes disposed on one side of the central interdigital transducer include first and second bisected comb electrodes obtained by bisecting the one of the

opposing comb electrodes along the surface-acoustic-wave propagation direction;

the first and second bisected comb electrodes are respectively displaced toward the first and second interdigital transducers and are respectively connected to first and second balanced signal terminals;

the first and second interdigital transducers which are adjacent to the central interdigital transducer are connected to an unbalanced signal terminal;

when, in the central interdigital transducer, an imaginary central axis that is substantially perpendicular to the surface-acoustic-wave propagation direction is assumed, design parameters of at least one of the interdigital transducers and the reflectors, which are disposed on opposite sides of the imaginary central axis in the central interdigital transducer that is substantially perpendicular to the surface-acoustic-wave propagation direction, are set to be different from one another at the sides of the imaginary central axis; and

the polarities of two outermost electrode fingers of the central interdigital transducer are substantially identical to that of a ground electrode or a float electrode, and an electrode-finger center-to-center distance between the first interdigital transducer and the first reflector adjacent to the first interdigital transducer is greater than an electrode-finger center-to-center distance between the second interdigital transducer and the second reflector adjacent to the second interdigital transducer.

Claim 34 (currently amended): ~~The surface acoustic wave filter according to Claim 27, wherein~~ A surface acoustic wave filter comprising:

a piezoelectric substrate; and

a longitudinally-coupled-resonator surface acoustic wave filter portion provided on the piezoelectric substrate; wherein

the longitudinally-coupled-resonator surface acoustic wave filter portion includes an odd number of at least three interdigital transducers arranged such that a plurality of comb electrodes having a plurality of electrode fingers are interdigitated, the interdigital

transducers being disposed along a surface-acoustic-wave propagation direction, and first and second reflectors disposed along the surface-acoustic-wave propagation direction so that the at least three interdigital transducers are located between the first and second reflectors;

the odd number of at least three interdigital transducers include a central interdigital transducer arranged in the approximate center, and first and second interdigital transducers disposed at two sides of the central interdigital transducer, an electrode finger of the first interdigital transducer which is adjacent to the central interdigital transducer is a ground electrode, and an electrode finger of the second interdigital transducer which is adjacent to the central interdigital transducer is a signal electrode;

the comb electrodes disposed on one side of the central interdigital transducer include first and second bisected comb electrodes obtained by bisecting the one of the opposing comb electrodes along the surface-acoustic-wave propagation direction;

the first and second bisected comb electrodes are respectively displaced toward the first and second interdigital transducers and are respectively connected to first and second balanced signal terminals;

the first and second interdigital transducers which are adjacent to the central interdigital transducer are connected to an unbalanced signal terminal;

when, in the central interdigital transducer, an imaginary central axis that is substantially perpendicular to the surface-acoustic-wave propagation direction is assumed, design parameters of at least one of the interdigital transducers and the reflectors, which are disposed on opposite sides of the imaginary central axis in the central interdigital transducer that is substantially perpendicular to the surface-acoustic-wave propagation direction, are set to be different from one another at the sides of the imaginary central axis; and

the polarities of two outermost electrode fingers of the central interdigital transducer are substantially identical to that of a signal electrode, and an electrode-

finger center-to-center distance between the second interdigital transducer and the second reflector adjacent to the second interdigital transducer is greater than an electrode-finger center-to-center distance between the first interdigital transducer and the first reflector adjacent to the first interdigital transducer.

Claim 35-43 (canceled).

Claim 44 (original): A surface acoustic wave filter comprising:
a piezoelectric substrate; and
a longitudinally-coupled-resonator surface acoustic wave filter portion disposed on the piezoelectric substrate; wherein

the longitudinally-coupled-resonator surface acoustic wave filter portion includes an odd number of at least three interdigital transducers arranged such that a plurality of comb electrodes having a plurality of electrode fingers are interdigitated, the interdigital transducers being disposed along a surface-acoustic-wave propagation direction, and first and second reflectors disposed along the surface-acoustic-wave propagation direction such that the at least three interdigital transducers are located between the first and second reflectors;

the odd number of at least three interdigital transducers includes a central interdigital transducer located in the approximate center, and first and second interdigital transducers disposed at two sides of the central interdigital transducer, an electrode finger of the first interdigital transducer which is adjacent to the central interdigital transducer is a ground electrode, and an electrode finger of the second interdigital transducer which is adjacent to the central interdigital transducer is a signal electrode;

the comb electrodes disposed on one side of the central interdigital transducer include first and second bisected comb electrodes obtained by bisecting the comb electrodes along the surface-acoustic-wave propagation direction;

the first and second bisected comb electrodes are respectively displaced toward the first and second interdigital transducers and are respectively connected to first and second balanced signal terminals;

the first and second interdigital transducers which are adjacent to the central interdigital transducer are connected to an unbalanced signal terminal;

the surface acoustic wave filter further includes first and second surface acoustic wave resonators respectively connected between the first interdigital transducer and the first balanced signal terminal and between the second interdigital transducer and the second balanced signal terminal;

each of the first and second surface acoustic wave resonators include an interdigital transducer and reflectors disposed at two sides of the interdigital transducer in the surface-acoustic-wave propagation direction; and

design parameters of the first and second surface acoustic wave resonators are different from one another.

Claim 45 (original): The surface acoustic wave filter according to Claim 44, wherein the electrode finger pitch of at least a portion of the first surface acoustic wave resonator is greater than the electrode finger pitch of the second surface acoustic wave resonator.

Claim 46 (original): The surface acoustic wave filter according to Claim 44, wherein a ratio between the electrode finger pitches of the interdigital transducer and one reflector in the first surface acoustic wave resonator is greater than a ratio between the electrode finger pitches of the interdigital transducer and one reflector in the second surface acoustic wave resonator.

Claim 47 (original): The surface acoustic wave filter according to Claim 44, wherein an electrode-finger center-to-center distance between the interdigital

transducer and one reflector in the first surface acoustic wave resonator is greater than an electrode-finger center-to-center distance between the interdigital transducer and one reflector in the second surface acoustic wave resonator.

Claim 48 (original): The surface acoustic wave filter according to Claim 44, wherein the duty of electrode fingers of the second surface acoustic wave resonator is greater than the duty of electrode fingers of the first surface acoustic wave resonator.

Claims 49 and 50 (canceled).

Claim 51 (original): The surface acoustic wave filter according to Claim 44, further comprising a second longitudinally-coupled-resonator surface acoustic wave filter portion cascade-connected to said longitudinally-coupled-resonator surface acoustic wave filter portion.

Claim 52 (currently amended): ~~The surface acoustic wave filter according to Claim 49, wherein~~ A surface acoustic wave filter comprising:

a piezoelectric substrate;

a longitudinally-coupled-resonator surface acoustic wave filter portion provided on the piezoelectric substrate; and

a second longitudinally-coupled-resonator surface acoustic wave filter portion cascade-connected to said longitudinally-coupled-resonator surface acoustic wave filter portion; wherein

the longitudinally-coupled-resonator surface acoustic wave filter portion includes an odd number of at least three interdigital transducers arranged such that a plurality of comb electrodes having a plurality of electrode fingers are interdigitated, the interdigital transducers being disposed along a surface-acoustic-wave propagation direction, and first and second reflectors disposed along the surface-acoustic-wave propagation

direction so that the at least three interdigital transducers are located between the first and second reflectors;

the odd number of at least three interdigital transducers include a central interdigital transducer arranged in the approximate center, and first and second interdigital transducers disposed at two sides of the central interdigital transducer, an electrode finger of the first interdigital transducer which is adjacent to the central interdigital transducer is a ground electrode, and an electrode finger of the second interdigital transducer which is adjacent to the central interdigital transducer is a signal electrode;

the comb electrodes disposed on one side of the central interdigital transducer include first and second bisected comb electrodes obtained by bisecting the one of the opposing comb electrodes along the surface-acoustic-wave propagation direction;

the first and second bisected comb electrodes are respectively displaced toward the first and second interdigital transducers and are respectively connected to first and second balanced signal terminals;

the first and second interdigital transducers which are adjacent to the central interdigital transducer are connected to an unbalanced signal terminal;

when, in the central interdigital transducer, an imaginary central axis that is substantially perpendicular to the surface-acoustic-wave propagation direction is assumed, design parameters of at least one of the interdigital transducers and the reflectors, which are disposed on opposite sides of the imaginary central axis in the central interdigital transducer that is substantially perpendicular to the surface-acoustic-wave propagation direction, are set to be different from one another at the sides of the imaginary central axis; and

the second longitudinally-coupled-resonator surface acoustic wave filter portion includes a central interdigital transducer and first and second interdigital transducers disposed at two sides of the central interdigital transducer, and the number of electrode fingers of the central interdigital transducer is even.

Claim 53 (currently amended): ~~The surface acoustic wave filter according to Claim 50, wherein~~ A surface acoustic wave filter comprising:

a piezoelectric substrate;

a longitudinally-coupled-resonator surface acoustic wave filter portion disposed on the piezoelectric substrate; and

a second longitudinally-coupled-resonator surface acoustic wave filter portion cascade-connected to said longitudinally-coupled-resonator surface acoustic wave filter portion; wherein

the longitudinally-coupled-resonator surface acoustic wave filter portion includes an odd number of at least three interdigital transducers arranged such that a plurality of comb electrodes having a plurality of electrode fingers are interdigitated, the interdigital transducers being disposed along a surface-acoustic-wave propagation direction, and first and second reflectors disposed along the surface-acoustic-wave propagation direction such that the at least three interdigital transducers are located between both reflectors;

the odd number of at least three interdigital transducers includes a central interdigital transducer arranged in the approximate center, and first and second interdigital transducers disposed at two sides of the central interdigital transducer, an electrode finger of the first interdigital transducer which is adjacent to the central interdigital transducer is a ground electrode, and an electrode finger of the second interdigital transducer which is adjacent to the central interdigital transducer is a signal electrode;

the comb electrodes disposed on one side of the central interdigital transducer include first and second bisected comb electrodes obtained by bisecting the one of the opposing comb electrodes along the surface-acoustic-wave propagation direction;

the first and second bisected comb electrodes are respectively displaced toward the first and second interdigital transducers and are respectively connected to first and

second balanced signal terminals;

the first and second interdigital transducers which are adjacent to the central interdigital transducer are connected to an unbalanced signal terminal;

the surface acoustic wave filter further includes first and second surface acoustic wave resonators respectively connected between the first interdigital transducer and the unbalanced signal terminal and between the second interdigital transducer and the unbalanced signal terminal;

each of the first and second surface acoustic wave resonators includes an interdigital transducer and reflectors disposed at two sides of the interdigital transducer in the surface-acoustic-wave propagation direction;

design parameters of the first and second surface acoustic wave resonators are different from one another; and

the second longitudinally-coupled-resonator surface acoustic wave filter portion includes a central interdigital transducer and first and second interdigital transducers disposed at two sides of the central interdigital transducer, and the number of electrode fingers of the central interdigital transducer is even.

Claim 54 (original): The surface acoustic wave filter according to Claim 51, wherein the second longitudinally-coupled-resonator surface acoustic wave filter portion includes a central interdigital transducer and first and second interdigital transducers disposed at two sides of the central interdigital transducer, and the number of electrode fingers of the central interdigital transducer is even.

Claims 55-57 (canceled).

Claim 58 (currently amended): A communication apparatus including the surface acoustic wave filter as defined in Claim 2733.

Application No. 10/521,776
November 13, 2006
Reply to the Office Action dated August 18, 2006
Page 11 of 13

Claim 59 (currently amended): A communication apparatus including the surface acoustic wave filter as defined in Claim ~~39~~34.

Claim 60 (original): A communication apparatus including the surface acoustic wave filter as defined in Claim 44.

Claim 61 new): A communication apparatus including the surface acoustic wave filter as defined in Claim 52.

Claim 62 (new): A communication apparatus including the surface acoustic wave filter as defined in Claim 53.